MODEL TW5005T

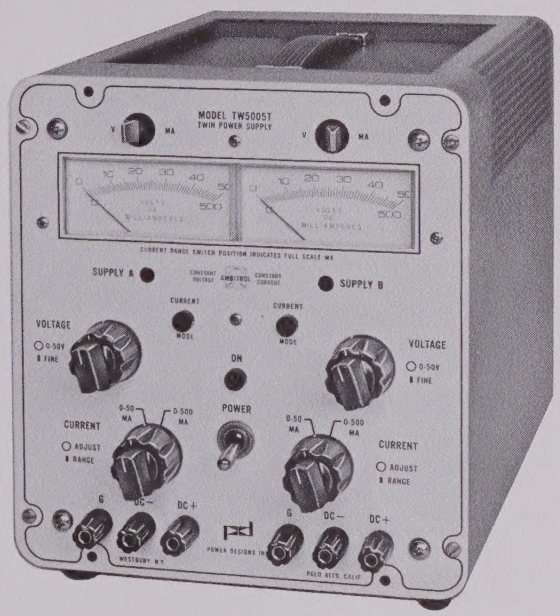
TWIN DC POWER SOURCE

TWO INDEPENDENT SOURCES:

0-50 VOLTS

0-500 MA

MAY BE OPERATED IN SERIES OR PARALLEL FOR 100-VOLT OR 1 AMPERE OUTPUT.



Each independent source in this general-purpose instrument can supply either a constant-voltage output with continuously adjustable current limiting or a constant-current output with continuously adjustable voltage compliance. The sources will automatically transfer from voltage regulation to current regulation or vice versa at any predetermined operating point.

Each source has two current ranges, 50 or 500 MA. When the current range is switched, the current-limit adjustment and the meter range are automatically transferred.

The output voltage and current may be remotely programmed by the connection of an external resistance to a rear-panel terminal strip. This portable instrument is ideally suited for both field and laboratory use. Its design simplicity results in a versatile unit capable of years of trouble-free service.

DESIGN FEATURES

- Dual (coarse and fine) voltage controls with 5 MV resolution.
- Dual range output-current adjustment with 250 μA resolution.
- Self-restoring electronic overload and short-circuit protection.
- All silicon-semiconductor regulator system.
- Front and rear output terminals.
- Modular construction permits multiple-unit rack mounting. One or two (four power sources on a single panel) supplies may be mounted in a standard 8¾" x 19" rack. See catalog sheet RPA-62 for rack-panel adapters.
- Processed under Power Designs' "Predictable-Reliability" program for a 5-year MTBF. The program features: avalanche-controlled silicon rectifiers, stress-tested transistors, pre-aged zener references with extrapolated stability criteria based on 1/f noise changes, computer-grade capacitors, tin-oxide-film resistors, 5 PPM sealed divider resistors, and components operated at 50% of manufacturers' published ratings. Units pre-aged under full-load conditions for a minimum of 50 hours.

POWER DESIGNS SERIAL NO: 709033

POWER DESIGNS INC.
1700 SHAMES DRIVE ■ WESTBURY, N.Y. 11590
Tel: 516-333-6200 ■ TWX 510-222-6561

POWER DESIGNS PACIFIC INC.
3381 MIRANDA AVENUE ■ PALO ALTO, CALIF. 94304
Tel: 415-493-6111 ■ TWX 910-373-1251

MODEL TW5005T

ELECTRICAL SPECIFICATIONS

INPUT - 105–125 V, 57–440 Hz, 90 W*.

FRONT-PANEL OUTPUT TERMINALS – Three insulated binding posts are provided for each source to handle positive output, negative output, and chassis ground. The positive or negative output of either source may be grounded, or the source may be left floating.

REAR-PANEL OUTPUT TERMINALS – A separate phenolic terminal strip is provided for each source. Screw terminals are included for: positive output, negative output, remote voltage programming, and remote current programming.

OPERATING TEMPERATURE RANGE – 0–50°C.

CONSTANT VOLTAGE MODE (Each Source)

RANGE – 0–50 VDC, 0–500 MA, continuously adjustable.

SERIES OPERATION – 0–100 VDC, 0–500 MA, continuously adjustable.

PARALLEL OPERATION – 0–50 VDC, 0–1 AMP, continuously adjustable.

REGULATION – Better than 0.005% + 1 MV at front and rear access terminals for 100% change in rated load or line variations within operating range.

RIPPLE AND NOISE – Less than 1 millivolt peak-to-peak, 350 microvolts rms.

RESPONSE TIME – Less than 50 microseconds for step change (1-microsecond rise time) in rated load from 10 to 100% or from 100 to 10%.

SOURCE IMPEDANCE – Less than 0.01 ohm at DC, 0.1 ohm at 20KHz, 0.7 ohm at 1 MHz.

*at nominal line voltage.

STABILITY – Less than 0.02% + 10 MV drift per 24-hour period after warm-up, at fixed line, load, and ambient temperature, and with low TC programming resistance.

TEMPERATURE COEFFICIENT – Less than 0.02% per °C.

REMOTE PROGRAMMING RESISTANCE – 200 ohms/volt.

VOLTAGE CONTROL – Dual concentric fine and coarse adjustment with 5 MV resolution.

CONSTANT CURRENT MODE (Each Source)

RANGE – 0–500 MA, continuously adjustable.

PARALLEL OPERATION – 0–1 AMP, continuously adjustable.

VOLTAGE COMPLIANCE – 50 volts in single or parallel operation, 100 volts in series operation.

REGULATION – Output current change less than 500 microamps for line voltage change of ±10% or load variations down to a short circuit across the output terminals.

RIPPLE AND NOISE – Less than 300 microamps, peak-to-peak.

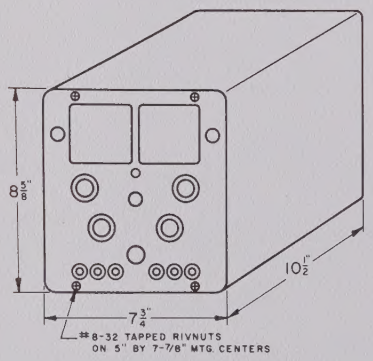
SOURCE IMPEDANCE – Greater than 100,000 ohms.

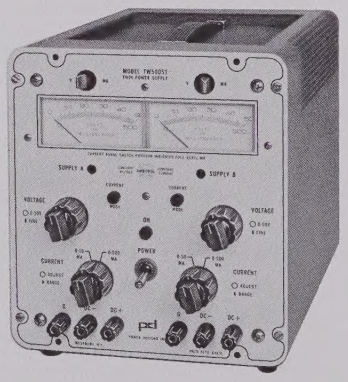
STABILITY – Less than 0.05% + 250 microamps drift per 24-hour period after warm-up, at fixed line, load, and ambient temperature, and with low TC programming resistance.

TEMPERATURE COEFFICIENT – 0.02% + 100 μA per °C.

CURRENT CONTROL – 0–50 MA and 0–500 MA, in two ranges with 0.25 MA resolution on 50 MA range and 2.5 MA resolution on 500 MA range.

DIMENSIONS





MECHANICAL SPECIFICATIONS

DIMENSIONS – 7¾" x 8⅜" x 10½" deep behind front panel.

WEIGHT – 17½ pounds.

FINISH – Panel is finished in brushed, natural aluminum with etched black lettering. Housing is finished in blue-gray vinyl enamel.

PRICE $319.00

FOB Westbury, N. Y.

Prices subject to change without notice

POWER DESIGNS

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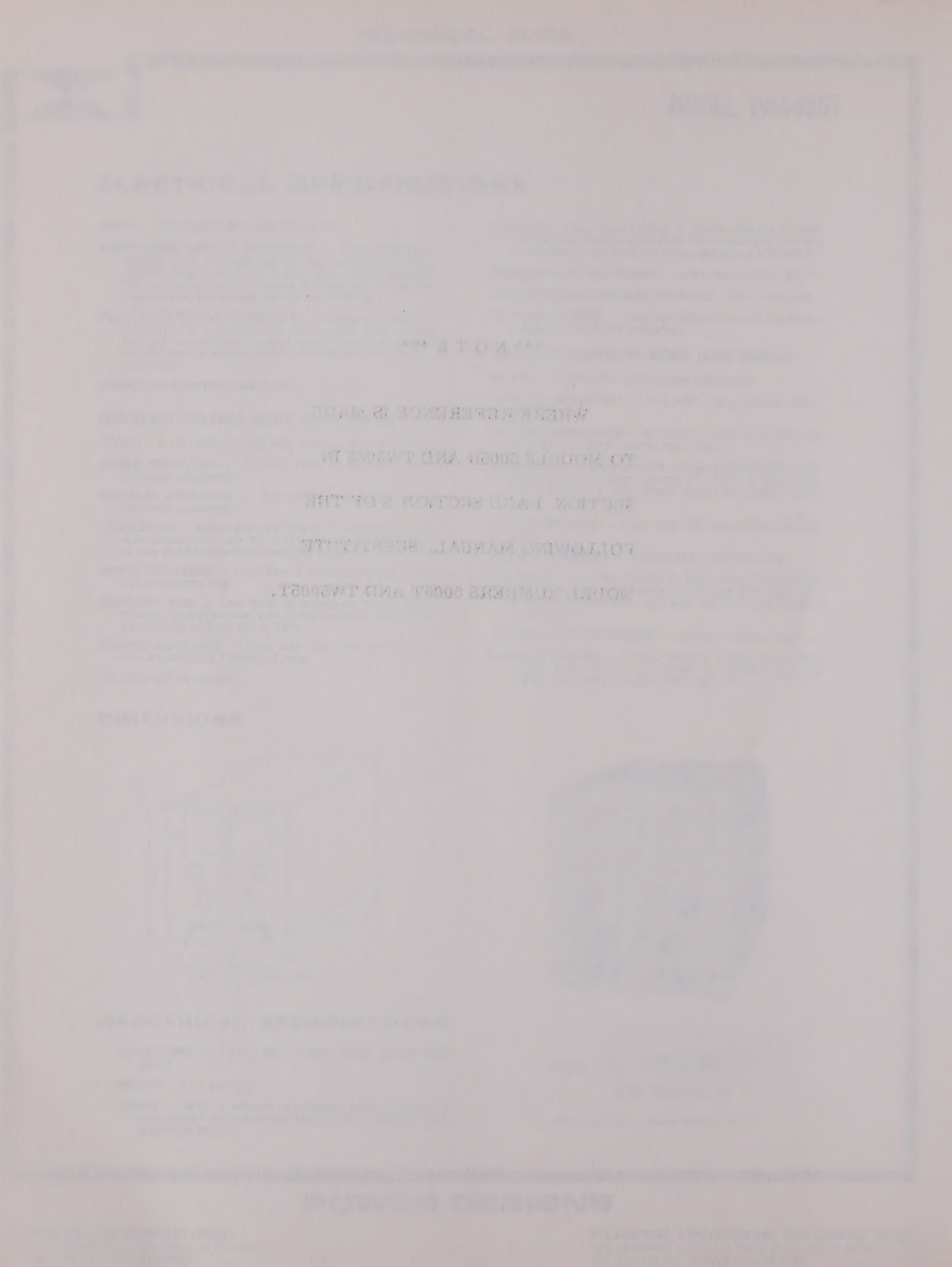
*** N O T E ***

WHERE REFERENCE IS MADE TO MODELS 5005R AND TW5005 IN SECTION 1 AND SECTION 2 OF THE FOLLOWING MANUAL, SUBSTITUTE MODEL NUMBERS 5005T AND TW5005T.



ADDENDA

MODEL TW5005T

The Electrical Parts List and/or Schematic has been modified as follows:

Circuit Number	Description	Mfr Code Number	Part Number
DELETE			
R7	Resistor, wirewound, trimmer, 5 kΩ, ± 10%, 1 1/4 w	98095	RWTP-502-C4
ADD			
R7	Resistor, wirewound, trimmer, 1 kΩ, ± 10%, 1 1/4 w	98095	RWTP-102-C4

SECTION 1
GENERAL DESCRIPTION

1-1. DESCRIPTION.

The Model TW5005 power supply consists of two Model 5005R power supplies in a single assembly. The two supplies are completely independent, except for a common power transformer. All instructions in this manual apply equally to the Model 5005R and to both sections of the Model TW5005, except as specifically indicated.

Each power supply is a general-purpose transistorized DC type which may be operated as a constant-voltage source with adjustable current limiting or as a constant-current source with adjustable voltage compliance. The power supply will electronically transfer between voltage and current modes, depending upon the setting of the controls and the value of the load resistance*.

Remote resistance programming of the output voltage or current may be accomplished by simple connections to a rear-panel terminal strip.

The power supply is protected against damage from external overloads, short circuits, and reverse load currents up to one ampere.

Compact and light, the instrument is self-contained in a portable housing equipped with rubber bumper feet for laboratory bench use. Recessed dimples in the top surface permit convenient nesting of the units for maximum space utilization. Rack panel adapters are available for mounting one or two units in a standard 19-inch relay rack. The panel adapter height is 5-1/4 inches for the Model 5005R and 8-3/4 inches for the Model TW5005.

1-2. ELECTRICAL SPECIFICATIONS

Refer to Table 1 for a complete list of the electrical specifications.

1-3. OUTPUT TERMINALS

a. Front Panel: Insulated binding posts are provided for positive output, negative output, and chassis ground. Spaced on 3/4-inch centers, the terminals will accept lugs, bare wire, banana plugs, or standard multi-pin banana connectors.

b. Rear Panel: Screw terminals on a phenolic terminal strip are provided for the DC output and the external resistance programming connections.

1-4. OUTPUT POLARITY

Either the positive or negative DC output terminal may be grounded, or both terminals may be left floating. The potential between output terminals and ground should not exceed 300 volts DC. The ripple content of the constant-current output may be affected by the type or location of output grounding, due to the effective high source impedance of the supply in this mode of operation.

---

* Ambitrol (R)

TABLE 1. ELECTRICAL SPECIFICATIONS

INPUT	5005R--105 to 125 V, 55 to 440 Hz, 50 watts (nominal). TW5005--105 to 125 V, 57 to 440 Hz, 90 watts (nominal).	
OPERATING TEMPERATURE	0°C to 50°C	
OUTPUT	CONSTANT VOLTAGE MODE	CONSTANT CURRENT MODE
Range	0 to 50 VDC	0 to 500 MA
Current Capacity	0 to 500 MA, max.	--
Voltage Compliance	--	0 to 50 volts
Regulation	*Front Terminals: 0.005% + 1 MV Rear Terminals: 0.01% + 3 MV For 100% change in rated load, or line variations within the operating range.	Output current change less than 500 μA for line voltage change of ± 10% or load variations down to a short circuit across the output.
Ripple and Noise	1 MV, peak-to-peak	Less than 300 μA, peak-to-peak
Temperature Coefficient (TC)	Less than 0.02% /°C	Less than 0.02% + 100 μA per °C
Stability	Less than 0.02% +10 MV drift per 24-hr. period after warm-up, with fixed line, load and ambient temperature, and with low TC external programming resistor.	Less than 0.05% + 250 μA drift per 24-hr. period after warm-up, with fixed line, load and ambient temperature, and with low TC external programming resistor.
Source Impedance	Less than 0.1 ohm to 20 KHz Less than 0.7 ohm to 1 MHz	Greater than 100,000 ohms.
Remote Programming Constant	200 ohms/volt	See paragraph 2-5.
Resolution	Coarse and fine voltage controls with better than 5 MV resolution	0-50 MA and 0-500 MA in two ranges with 0.25 MA resolution on 50 MA range and 2.5 MA on the 500 MA range.
Recovery Time	Less than 50 usec for a 1 usec (rise time) step change in rated load from 10% to 100% or vice versa.	

* Model TW5005 has 0.005% + 1 MV regulation at both front and rear terminals.

1-5. METERING

A single meter with dual scales, and a function selector switch, permits monitoring of either output voltage or current.

1-6. CIRCUIT PROTECTION

The AC line and DC load circuits are separately fused. The maximum output current of the supply is electronically limited to approximately 550 milliamperes. The DC fuse will blow in the event of an internal circuit failure which results in excessive internal or external load currents.

1-7. MECHANICAL SPECIFICATIONS

a. Dimensions: Model 5005R -- 8-3/8 inches wide by 4-3/4 inches high by 11-9/16 inches deep behind front panel. Model TW5005 -- 7-3/4 inches wide by 8-5/8 inches high by 13-1/16 deep behind front panel.

b. Finish: The panel is finished in brushed, anodized, natural aluminum with etched black lettering. The housing is finished in blue-gray vinyl enamel.

c. Weight: Model 5005R -- 8.5 pounds. Model TW5005 -- 17.5 pounds.

SECTION 2
INSTALLATION AND OPERATION

2-1. INSTALLATION

a. Laboratory Bench: The Models 5005R and TW5005 are portable units designed for bench use. No preliminary processing or unpacking procedures are required. The power supplies are ready for operation as shipped from the factory.

b. Rack Mounting: Panel adapters are available for mounting one or two units in a standard 19-inch relay rack. Hardware kits are provided with each panel adapter. The supply is fastened to the rear surface of the panel adapter by means of the black anodized rivnuts in each corner of the power supply panel. If the rubber bumper feet interfere with the assembly of the equipment to the rack, they can be removed by disassembling the power-supply bottom plate and unscrewing them on the Model 5005R, or by removing the housing and unscrewing them on the Model TW5005.

2-2. CONSTANT-VOLTAGE OPERATION

a. Voltage Adjustment:

(1) Rotate the FINE current control fully counterclockwise.

(2) Rotate the 0-50 VOLTS control fully counterclockwise.

(3) Set the AC ON toggle switch in its off position. Connect the power cord into a convenient source of 115 VAC, 57 to 440 Hz.

(4) Set the toggle switch to AC ON. The neon pilot indicator should illuminate.

(5) Set the meter function switch to V and adjust the 0-50 VOLTS and FINE controls to the desired output voltage. The FINE control has a range of approximately 0.5 volt. It permits setting the output voltage with a resolution of better than 5 millivolts.

NOTE

When the voltage and current controls are turned fully counterclockwise, the output voltage will go through zero and reverse approximately 0.5 volt. Under these conditions a maximum load current of 3 milliamperes can flow through the load.

b. Output Current Limiting:

(1) Set the toggle switch to its off position.

(2) Connect a jumper wire across the output terminals.

(3) Set the toggle switch to AC ON and the meter function switch to MA.

(4) Set the CURRENT RANGE control to the desired current range and adjust the FINE current control to the desired current-limit level.

(5) Set the toggle switch to its off position.

(6) Remove the jumper wire from the output terminals.

(7) Connect the external load to the front-panel binding posts or to the rear-panel terminals marked DC+ and DC-.

(8) If desired, connect a jumper wire from either output terminal to the G (chassis ground) terminal on the front panel.

(9) Set the toggle switch to AC ON.

c. Output Current Limiting (Alternate Method): An alternate, but less-accurate, method of current limiting may be employed when a load is connected to the output terminals.

(1) Set the power switch to AC ON and the meter function switch to V.

(2) Rotate the FINE current control counterclockwise from its maximum position until the meter reading just starts to drop.

(3) Rotate the FINE current control clockwise from this threshold (voltage-to-current transfer) point to the approximate current-limiting point desired.

2-3. CONSTANT-CURRENT OPERATION

a. Current Adjustment:

(1) Rotate the 0-50 VOLTS and FINE voltage controls fully clockwise.

(2) Set the CURRENT RANGE control to the desired current range and the FINE current control fully counterclockwise.

(3) Connect a jumper wire across the output terminals.

(4) Set the toggle switch to AC ON.

(5) Set the meter function switch to A and adjust the FINE current control to the desired output current.

(6) Set the toggle switch to its off position.

(7) Remove the jumper wire and connect the external load to either the front-panel or rear-panel DC+ and DC- terminals.

(8) If desired, connect a jumper wire from either output terminal to the G (chassis ground) terminal on the front panel.

(9) Set the toggle switch to AC ON.

NOTE

The constant-current supply is effectively a high-impedance source. The electrostatic (capacitive) relationship of the source and the load to external grounds and/or the AC line may affect the ripple component of the output current. Reversing the AC line cord to the supply, experimentally selecting an optimum ground point at the load, or floating the power supply output terminals may minimize the ripple component.

b. Voltage Limiting: With the voltage controls set fully clockwise, the maximum compliance voltage of the supply is approximately 51 volts. If it is desired to limit the maximum output voltage of the supply below this value, proceed as follows:

(1) Set the toggle switch to its off position and remove the load from the supply.

(2) Set the meter function switch to V and the toggle switch to AC ON.

(3) Adjust the 0-50 VOLTS and FINE voltage controls to the desired maximum compliance value (as indicated on the front-panel meter).

(4) Connect the load to the supply and set the toggle switch to AC ON.

2-4. REMOTE VOLTAGE PROGRAMMING

The output voltage can be programmed remotely by an external fixed or variable resistance. For remote programmed constant voltage, proceed as follows:

a. Set the toggle switch to its off position.

b. Remove the link between screw terminals RV1 and RV2 on the rear-panel terminal strip.

c. Select the required resistance by multiplying the required value of voltage by 200 (programming constant is approximately 200 ohms per volt). The resistance may have to be trimmed slightly to produce the exact output voltage required. A constant current of 5 milliamperes will flow through this resistance, and its wattage rating should be chosen to minimize drift due to heating effects.

d. Connect the external programming resistance between the RV1 and DC- terminals.

e. Set the toggle switch to AC ON.

CAUTION

If the remote programming connections are opened while the supply is operating, the output voltage will rise to the maximum compliance of the supply (over 50 volts). When a switch is used to select resistors for output-voltage programming, it should have shorting-type contacts, to avoid voltage spikes.

2-5. REMOTE CURRENT PROGRAMMING

The output current can be programmed remotely by employing external fixed or variable resistance. For remote programmed constant current, proceed as follows:

a. Set the toggle switch to its off position.

b. Rotate the FINE current control fully clockwise. (This control will be in parallel with the external programming resistor and will affect the current output if not left in this position.)

c. Select the required resistance by using the following relationships:

With the CURRENT RANGE switch set to 0-500 MA:

$$R = \frac{21}{5I - 1}$$

With the CURRENT RANGE switch set to 0-50 MA:

$$R = \frac{213 \times I}{54 - I}$$

Where I = desired output current in milliamperes

R = remote programming resistance in ohms.

d. Connect the external programming resistance between the RC and DC+ terminals on the rear-panel terminal strip.

e. Set the toggle switch to AC ON.

2-6. ELECTRONIC VOLTAGE-CURRENT OR CURRENT-VOLTAGE CROSSOVER

The Model 5005R can switch electronically from a constant-voltage source to a constant-current source or vice versa. The power supply can be adjusted to switch at any voltage or current in its operating range. Proceed as follows to set the switching point for either direction of crossover (constant voltage to current or current to voltage).

a. Check that the toggle switch is off and remove the load from the power supply.

b. Set the CURRENT RANGE switch to 0-500 MA and the FINE current control completely clockwise.

c. Set the toggle switch to AC ON and adjust the 0-50 VOLTS and FINE voltage controls to the desired voltage crossover point.

d. Set the toggle switch to its off position and connect a jumper wire across the output terminals.

e. Set the toggle switch to AC ON and the meter function switch to MA.

f. Set the CURRENT RANGE control to the desired current range and adjust the FINE current control to the desired crossover point.

g. Set the toggle switch to its off position and connect the load.

h. Set the toggle switch to AC ON. The power supply will function as a constant-voltage source when the product of the load resistance and the constant current is less than the preset voltage. The supply will function as a constant-current source when the product of the load resistance and the preset current is greater than the preset voltage. The power supply will automatically switch back and forth to either mode of operation, depending upon the load resistance value. In the crossover region, the output voltage will not change more than 0.1% or 50 millivolts from its preset value; the output current will not change more than 0.1% or 500 microamperes from its preset value. In the regions beyond the crossover area, the voltage or current regulation will be within the rated specifications for that mode of operation.

2-7. SERIES OPERATION

a. Constant Voltage: As many as eight Model 5005R units may be operated in series to provide up to 400 volts. In series operation, the CURRENT RANGE and FINE current controls on all units should be set completely clockwise. The ground terminals on all units may be left floating or may be connected together and tied to either the most negative or positive output terminal. After the units are connected together, proceed as directed in paragraph 2-2, except adjust current limiting as indicated in paragraph b below.

b. Current Limiting or Constant Current: The Model 5005R may be operated as a constant-voltage source with current limiting or as a constant-current source with voltage compliance when connected in series. However, each power supply connected in series operates independently as far as electronic crossover from voltage regulation to current regulation is concerned. A typical example is that of two supplies connected in

series, each adjusted for a 40-volt, 100-milliampere output. With a resistive load slightly less than 800 ohms, only one of the supplies will automatically crossover into the constant-current mode. The power supply which first switches into the constant-current mode will provide constant current, the other supply will continue acting as a constant voltage source. As the load resistance continues to decrease, the power supply in the constant-current mode will maintain stable output current until it reaches zero output voltage. With a further decrease in load resistance, the voltage across this supply reverses. An internally connected silicon power diode (CR15), shunted across the output terminals (normally non-conductive), becomes conductive and carries the load current around this unit. At this point, the power supply in its constant voltage mode will crossover into the constant current mode and maintain the output current at its own current setting.

If desired, output current settings of both power supplies may be set to two distinct values to provide a discrete shift to a new current level. Similarly, a number of supplies connected in series will crossover automatically to constant-current operation in the sequential order of the lower preset current levels.

2-8. PARALLEL OPERATION

Two units may be operated in parallel to obtain up to one ampere as follows:

a. Turn on the supplies and set them for the desired output voltage compliance.

b. Set the CURRENT RANGE controls on both power supplies to the 0-500 MA positions.

c. Adjust each FINE current control to 500 milliamperes.

d. Connect the DC+ output terminals together.

e. Connect a 0 to 10 MA meter between the two DC- output terminals.

f. Adjust the voltage controls of one supply until the milliammeter indicates zero.

g. Disconnect the milliammeter and connect the negative terminals together.

h. Connect the load to the power supplies. The power supplies furnish current to the load sequentially. For currents from 0 to 500 milliamperes, one supply will function as the current source. Beyond this point, the second supply will provide current to the load, up to a maximum total current of 1 ampere.

APPENDIX

1. INTRODUCTION

This Appendix contains an Electrical Parts List, Schematic Diagram, Parts Location Diagram and equipment Warranty.

2. ELECTRICAL PARTS LIST

All electrical and electronic parts are listed in the sequence of their circuit numbers as shown on the Schematic Diagram. A brief description of each part is given, followed by the code number of the manufacturer and his part number. All manufacturers' code numbers are taken from Cataloging Handbooks H4-1 and H4-2, Federal Supply Code for Manufacturers. These handbooks can be obtained from Federal Agencies or ordered directly from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

We recommend that all parts with the code number 98095 be ordered directly from Power Designs, Inc. The commercial equivalents of these parts may have wide parameter tolerances or require special factory inspection or modification before they can be used in the power supply.

All components used in the power supply or supplied as replacements are carefully inspected at the factory. Inspections are performed on a 100% basis or at AQL levels to Military Specification MIL-Q-9858 under which Power Designs, Inc. has been qualified.

All semiconductors are inspected on a 100% basis, not only for operating parameters, but also for critical characteristics related to reliability and predictable life expectancy. Some of these characteristics are observed when the device is taken beyond its normal operating regions. These test techniques have been developed under a "predictable reliability" program in operation at Power Designs, Inc. for the past twelve years. Under this program, quality control procedures are constantly revaluated and updated as advances are made in solid state technology and experience is gained from field history.

Semiconductor manufacturers are continually modifying their products. Complete lines are discontinued to be replaced by devices having improved gain, operating voltage levels and frequency responses. The high gain, closed loop DC amplifiers used in regulator circuits are particularly sensitive to slight changes in these parameters. Commercial or military "equivalent" transistors may affect the performance of the power supply. We can assure compliance with the original specifications if replacement semiconductors are ordered from the Factory.

All replacement semiconductors are processed and stocked at the factory to insure complete interchangeability with the devices in the original equipment. These devices are coded with a Power Designs, Inc. part number. For example:

MS	1028	A
Semiconductor Manufacturer's Code	Power Designs, Inc. Type	Suffix Identifying Special Parameters

When ordering replacements, please identify the device as thoroughly as possible, giving the model and serial number if available.

The replacement part you receive may not have the same part number as that shown on the Electrical Parts List. This can be due to several factors:

a. A different prefix indicates that Power Designs, Inc. is using another vendor source. The operating characteristics of the devices are identical.

b. A completely different part number indicates:

1. The original vendor has discontinued manufacture of the item or can no longer manufacture it to the original specifications.

2. A better device for use in a particular circuit has been substituted.

3. Tighter controls for interchangeability have provided greater assurance of reliability with the replacement.

ELECTRICAL PARTS LIST

The Model TW5005T consists of two independent power sources with a common power transformer. The following Electrical Parts List is applicable to each of the two units.

NOTE: Before replacing semiconductors, see paragraph 2 of this Appendix.

Circuit Number	Description	Mfr Code Number	Part Number
C1	Capacitor, electrolytic, 1200 μf, 30 vdc	98095	CE-109-.3
C2	Capacitor, plastic film, .047 μf, 80 vdc	98095	CP-35-.8
C3	Capacitor, tantalum, 6.8 μf, 35 vdc	98095	CE-6A8-.35
C4	Capacitor, plastic film, .001 μf, 200 vdc	98095	CP-24-2
C5	Capacitor, tantalum, 6.8 μf, 35 vdc	98095	CE-6A8-.35
C6	Capacitor, electrolytic, 400 μf, 100 vdc	98095	CE-83-.85
C7	Capacitor, tantalum, 6.8 μf, 35 vdc	98095	CE-6A8-.35
C8	Capacitor, electrolytic, 51 μf, 50 vdc	98095	CEX-51-50
C9	Capacitor, electrolytic, 8 μf, 100 vdc	98095	CE-42-1
C10	Capacitor, electrolytic, 51 μf, 50 vdc	98095	CEX-51-50
C11, C12	Capacitor, disc, .02 μf, 500 vdc	98095	CC-23-5
C13	Capacitor, plastic film, 0.01 μf, 200 vdc	98095	CP-16-2
C14	Capacitor, axial lead, 0.01 μf, 200 vdc	14936	Type 165
C15	Capacitor, ceramic disc, 100 pf, 1000 vdc ± 10%	15450	831-000X5F0101K
C16	Capacitor, plastic film, 0.1 μf, 200 vdc	98095	CP-17-2
CR1, CR2	Diode, silicon	98095	GI44
CR3	Diode, silicon, zener	98095	SV359C, D
CR4	Diode, silicon	98095	GI44
CR5	Diode, silicon, zener	98095	AC359Z (Sel)
CR6, CR7	Diode, silicon	98095	GI44
CR8	Diode, silicon, zener	98095	SV359D
CR9 thru CR16	Diode, silicon	98095	GI44
DS1	Neon Lamp	98095	PLA-19
DS2	Incandescent Lamp (current mode ind.)	98095	PLA-21
F1	Fuse, 1-1/2A, Slo Blo (AC)	71400	MDL
F2	Fuse, 3/4 A, Slo-Blo (DC)	71400	MDL
M1	Meter, 0-50V, 0-500 mA	98095	MVA-140
Q1, Q2	Transistor, silicon, PNP	98095	TI1028A
Q3, Q4	Transistor, silicon, NPN	98095	TI2270/U
Q5	Transistor, silicon, PNP	98095	TI1028A

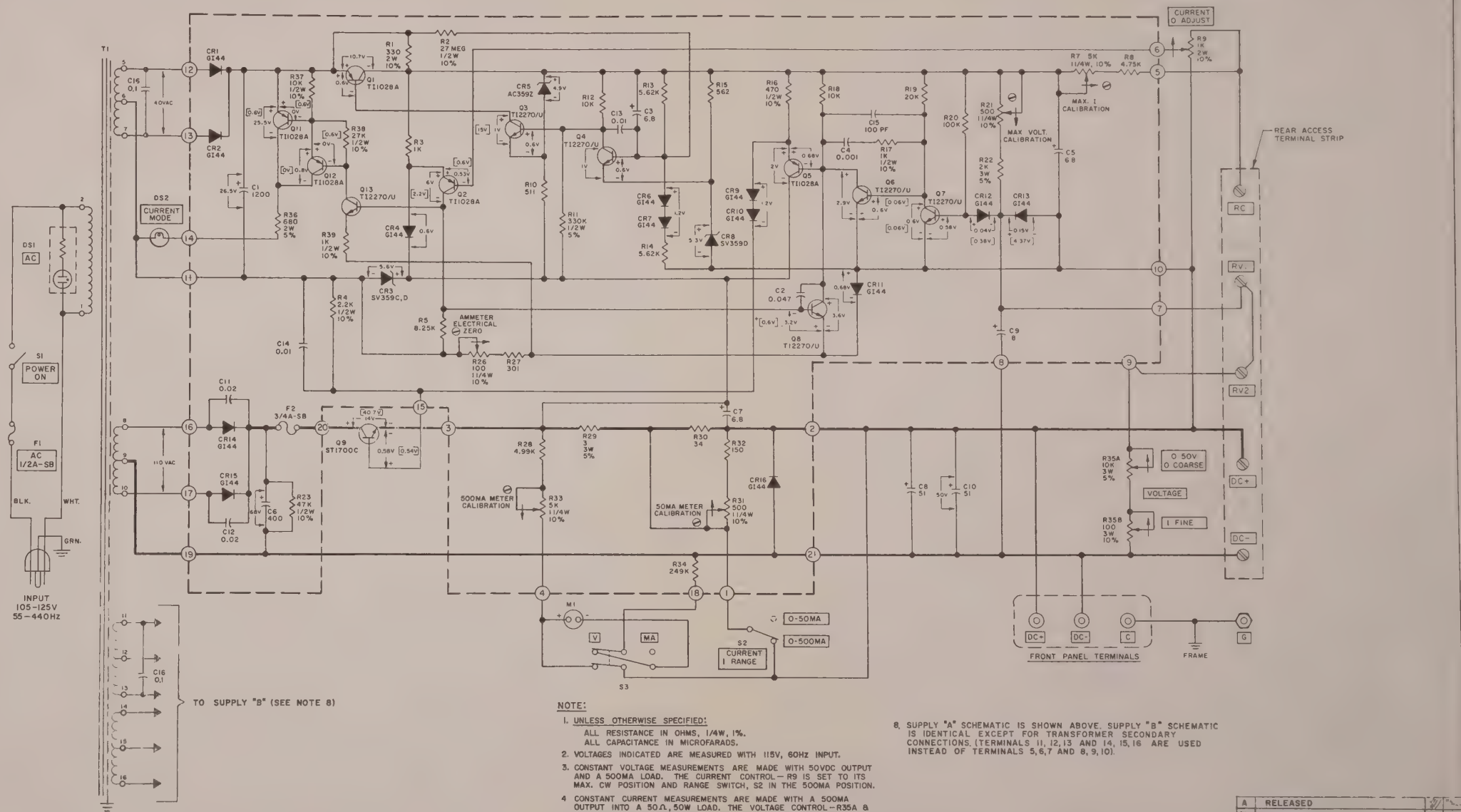
Circuit Number	Description	Mfr Code Number	Part Number
Q6 thru Q8	Transistor, silicon, NPN	98095	TI2270/U
Q9	Transistor, silicon, NPN	98095	ST1700C
Q11, Q12	Transistor, silicon, PNP	98095	TI1028A
Q13	Transistor, silicon, NPN	98095	TI2270/U
R1	Resistor, composition, 330 Ω, ± 10%, 2 w	01121	HB3311
R2	Resistor, composition, 27 megΩ, ± 10%, 1/2 w	01121	EB2761
R3	Resistor, precision, metal film, 1 kΩ, ± 1%, 1/4 w	98095	RD-102-1QA
R4	Resistor, composition, 2200 Ω, ± 10%, 1/2 w	01121	EB2221
R5	Resistor, precision, metal film, 8250 Ω, ± 1%, 1/4 w	98095	RD-8251-1QA
R7	Resistor, var., ww, trimmer, 5 kΩ, ± 10%, 1-1/4 w	98095	RWTP-502-C4
R8	Resistor, precision, metal film, 4.75 kΩ, ± 1%, 1/4 w	98095	RD-4751-1QA
R9	Potentiometer, 1 kΩ, ± 10%, 2 w(part of S2/R9 assy)	98095	B67043
R10	Resistor, precision, metal film, 511 Ω, ± 1%, 1/4 w	98095	RD-5110-1QA
R11	Resistor, composition, 330 kΩ, ± 5%, 1/2 w	01121	EB3345
R12	Resistor, precision, metal film, 10 kΩ, ± 1%, 1/4 w	98095	RD-103-1QA
R13, R14	Resistor, precision, metal film, 5.62 kΩ, ± 1%, 1/4 w	98095	RD-5621-1QA
R15	Resistor, precision, metal film, 562 Ω, ± 1%, 1/4 w	98095	RD-5620-1QA
R16	Resistor, composition, 470 Ω, ± 10%, 1/2 w	01121	EB4711
R17	Resistor, composition, 1 kΩ, ± 10%, 1/2 w	01121	EB1021
R18	Resistor, precision, metal film, 10 kΩ, ± 1%, 1/4 w	98095	RD-103-1QA
R19	Resistor, precision, metal film, 20 kΩ, ± 1%, 1/4 w	98095	RD-203-1QA
R20	Resistor, precision, metal film, 100 kΩ, ± 1%, 1/4 w	98095	RD-104-1QA
R21	Resistor, var., ww, trimmer, 500 Ω, ± 10%, 1-1/4 w	98095	RWTP-501-C4
R22	Resistor, wirewound, 2 kΩ, ± 5%, 3 w	98095	RW-202-3KA
R23	Resistor, composition, 47 kΩ, ± 10%, 1/2 w	01121	EB4731
R26	Resistor, var., ww, trimmer, 100 Ω, ± 10%, 1-1/4 w	98095	RWTP-101-C4
R27	Resistor, precision, metal film, 301 Ω, ± 1%, 1/4 w	98095	RD-3010-1QA
R28	Resistor, precision, metal film, 4.99 kΩ, ± 1%, 1/4 w	98095	RD-4991-1QA
R29	Resistor, wirewound, 3 Ω, ± 5%, 3 w	98095	RW-030-3KA
R30	Resistor, precision, metal film, 34 Ω, ± 1%, 1/4 w	98095	RD-340-1QA
R31	Resistor, var., ww, trimmer, 500 Ω, ± 10%, 1-1/4 w	98095	RWTP-501-C4
R32	Resistor, precision, metal film, 150 Ω, ± 1%, 1/4 w	98095	RD-151-1QA
R33	Resistor, var., ww, trimmer, 5 kΩ, ± 10%, 1-1/4 w	98095	RWTP-502-C4
R34	Resistor, precision, metal film, 249 kΩ, ± 1%, 1/4 w	98095	RD-2493-1QA
R35A	Potentiometer, ww, tandem, 10 kΩ, ± 5%, 3 w	98095	RWVT-5807
R35B	Potentiometer, ww, tandem, 100 Ω, ± 10%, 3 w	98095	RWVT-5807
R36	Resistor, composition, 680 Ω, ± 5%, 2 w	01121	HB6815
R37	Resistor, composition, 10 kΩ, ± 10%, 1/2 w	01121	EB1031
R38	Resistor, composition, 27 kΩ, ± 10%, 1/2 w	01121	EB2731
R39	Resistor, composition, 1 kΩ, ± 10%, 1/2 w	01121	EB1021

ELECTRICAL PARTS LIST

Circuit Number	Description	Mfr Code Number	Part Number
S1	Switch, toggle, SPST	98095	ST-5
S2	Switch, DPST (part of S2/R9 assy)	98095	B67043
S3	Switch, toggle, DPDT	98095	ST-16
T1	Transformer	98095	TTM-TW5005T(*)

CODE LIST OF MANUFACTURERS

01121	Allen Bradley Co.	Milwaukee, Wisconsin
14936	General Instrument Corp.	Hicksville, New York
15450	Erie Technological Products Inc.	Erie, Pennsylvania
71400	Bussman Mfg. Division	St. Louis, Missouri
98095	Power Designs Inc.	Westbury, New York



NOTE:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE IN OHMS, 1/4W, 1%.
   ALL CAPACITANCE IN MICROFARADS.
2. VOLTAGES INDICATED ARE MEASURED WITH 115V, 60Hz INPUT.
3. CONSTANT VOLTAGE MEASUREMENTS ARE MADE WITH 50VDC OUTPUT AND A 500MA LOAD. THE CURRENT CONTROL — R9 IS SET TO ITS MAX. CW POSITION AND RANGE SWITCH, S2 IN THE 500MA POSITION.
4. CONSTANT CURRENT MEASUREMENTS ARE MADE WITH A 500MA OUTPUT INTO A 50Ω, 50W LOAD. THE VOLTAGE CONTROL — R35A & B ARE SET TO THE MAX. CW POSITION AND RANGE SWITCH, S2 IN THE 500MA POSITION.
5. WHERE DUAL VOLTAGES ARE INDICATED, THOSE IN BRACKETS REFER TO CONSTANT CURRENT OPERATION.
6. WHERE SINGLE VOLTAGES ARE INDICATED, THEY APPLY TO BOTH MODES OF OPERATION.
7. MEASUREMENTS MADE WITH 20,000Ω/VOLT METER FOR DC AND AND 1000Ω/VOLT METER FOR AC. VOLTAGES ARE DC, EXCEPT WHERE OTHERWISE INDICATED.
8. SUPPLY "A" SCHEMATIC IS SHOWN ABOVE. SUPPLY "B" SCHEMATIC IS IDENTICAL EXCEPT FOR TRANSFORMER SECONDARY CONNECTIONS. (TERMINALS 11, 12, 13 AND 14, 15, 16 ARE USED INSTEAD OF TERMINALS 5, 6, 7 AND 8, 9, 10).

SHEET 1 OF 2

NOTICE
PATENTS HAVE BEEN GRANTED, PATENT APPLICATIONS ARE PENDING OR IN PROCESS OF PREPARATION ON THE PROPRIETARY PORTIONS OF THE CIRCUITS SHOWN ON THIS DRAWING. REPRODUCTION IN WHOLE OR IN PART MAY NOT BE MADE WITHOUT PERMISSION.

SYM	REVISIONS	APPD	DATE
A	RELEASED		

DRAWING NO. PS-TW5005T-1 REV. A

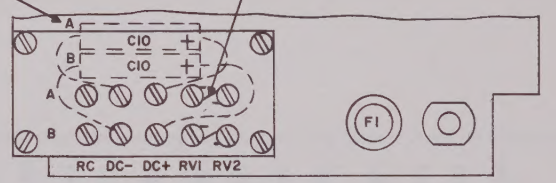
TITLE SCHEMATIC, MODEL TW5005T TWIN POWER SUPPLY

DRAWN	CHECKED	APPROVED
HC		
DATE 11/1/72	DATE 11/30/72	DATE 11/30/72

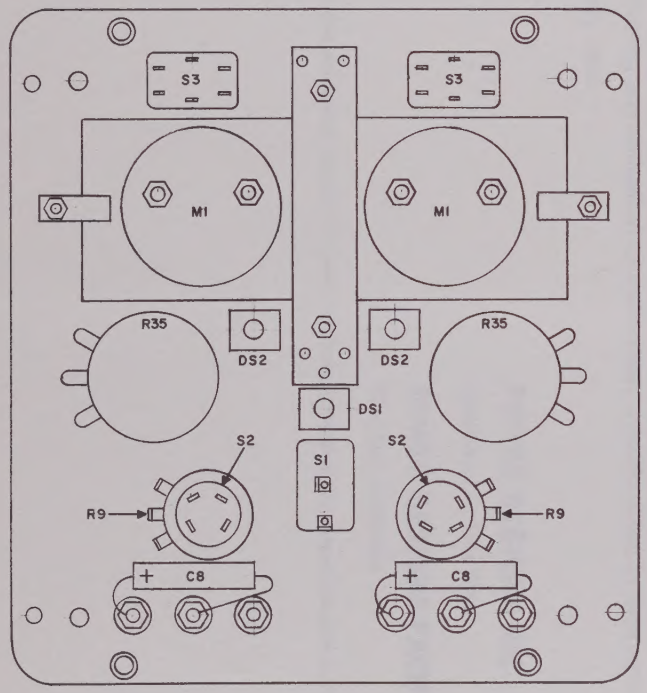
Power Designs Inc. NEW YORK

REFERENCE LETTERS SHOWN ADJACENT TO COMPONENTS INDICATE THE SUPPLY (A OR B) IN WHICH THEY FUNCTION.

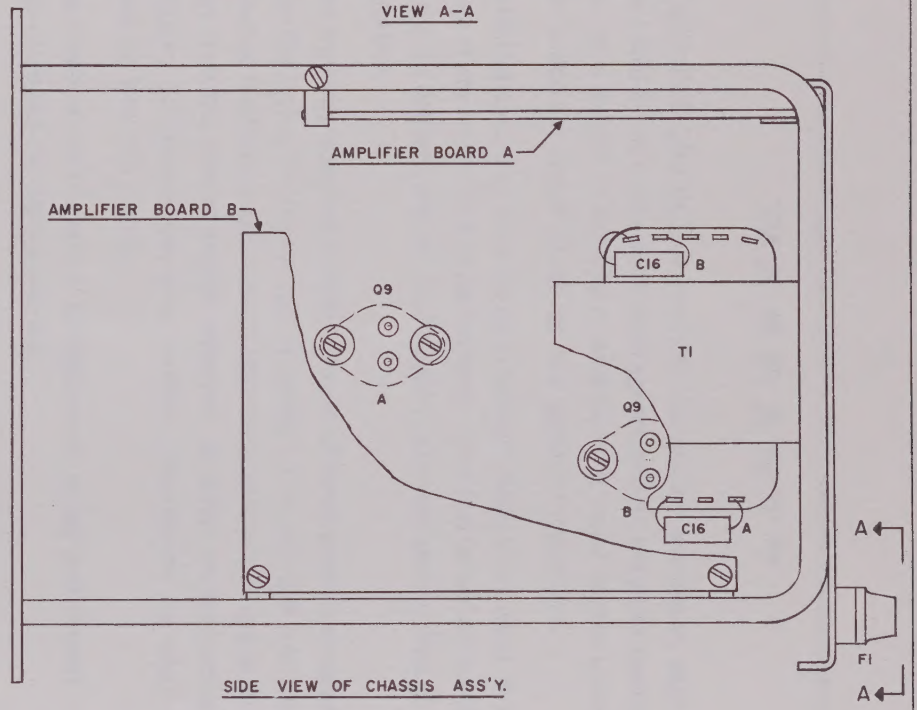
SHORTING LINKS ARE AS CONNECTED FOR NORMAL OPERATION OF UNIT. (FOR REMOTE VOLTAGE OR CURRENT PROGRAMMING OR EXTENDING THE OUTPUT VOLTAGE RANGE SEE INSTRUCTION MANUAL).



VIEW A-A



REAR OF PANEL ASS'Y.



SIDE VIEW OF CHASSIS ASS'Y.

SHEET 2 OF 2

DO NOT SCALE THIS DRAWING

UNLESS OTHERWISE SPECIFIED
TOLERANCES FRACTIONAL ± 1/64 DECIMAL ± .005 ANGLES ± 0° 30'
DIMENSIONS AND TOLERANCES TO BE HELD
REMOVE ALL BURRS AND SHARP EDGES

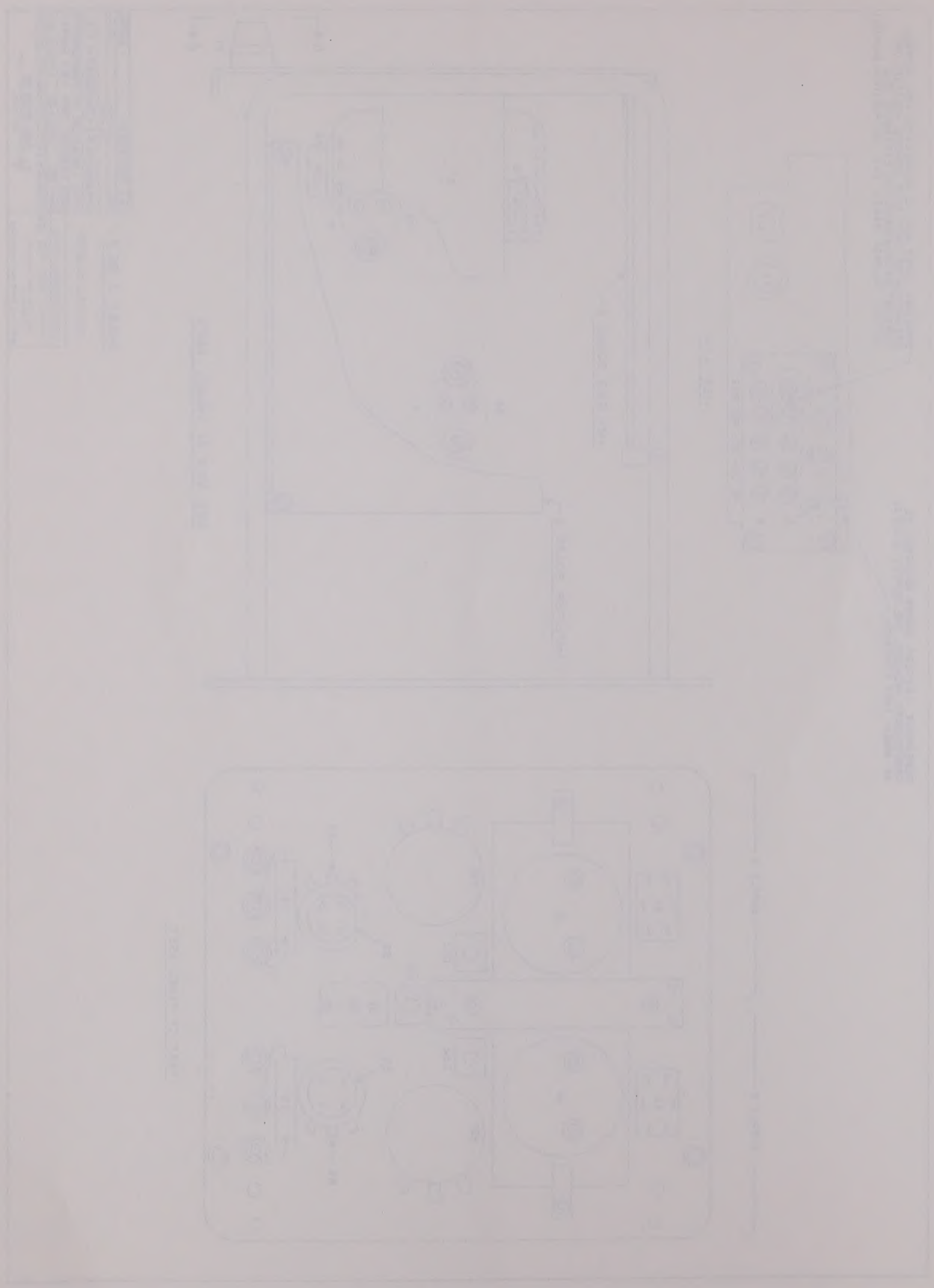
SYM	REVISIONS DESCRIPTION	APPD.	DATE
A	RELEASED		

DRAWING NO. PS-TW5005T-1 REV A

TITLE LOCATION OF COMPONENTS MOD. TW5005T TWIN PWR SUPPLY

DRAWN	CHECKED	APPROVED
HC		
DATE 10/24/72	DATE 11-30-72	DATE 11-30-72

Power Designs Inc.
NEW YORK



WARRANTY

POWER DESIGNS INC., warrants to the original purchaser, each instrument sold by us, or our authorized agents, and all the parts thereof, to be free from defects in material or workmanship under normal use and service within the specified ratings and operating conditions.

Its obligation under this warranty is hereby limited to the repair or replacement of any instrument, or part thereof, which is returned to us within one year after delivery, and which shall prove, after our examination, to be thus defective.

This warranty does not include the cost of transportation charges to and from the factory and/or the cost of packaging or crating of instruments for return to the factory, unless such instrument is returned within thirty (30) days from the date of original shipment as shown on the packing list or shipping documents, and prior written authorization for such costs is obtained from the factory.

The repair or replacement of an instrument, or any part thereof, does not void or extend the original warranty.

POWER DESIGNS INC., reserves the right to discontinue any instrument without notice, or to make modifications in design at any time, without incurring any obligation to make these modifications in instruments previously sold.

POWER DESIGNS INC.
Westbury, L. I., New York

POWER DESIGNS PACIFIC, INC.
Palo Alto, California